

Fast Readout for Large Area Photon-Counting Infrared Detectors, Phase II

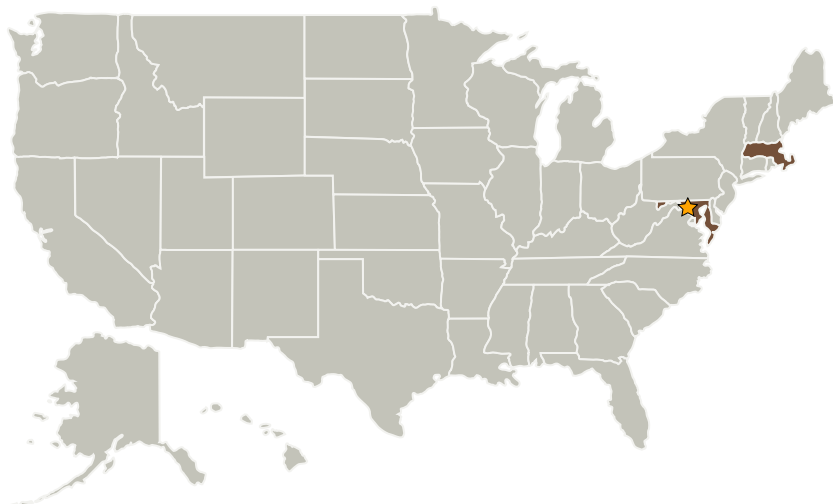
Completed Technology Project (2007 - 2009)



Project Introduction

Many NASA space and Earth programs in the infrared range 1060-1550 nm are limited by the detector performance that require long exposure time due to their low sensitivity and/or high noise. Large format infrared photon counting arrays with ranging capability would provide a valuable tool to many space missions. Current state of the art fabrication of photon counting infrared detector arrays on non-silicon semiconductors is not mature enough to monolithically integrate complex readout circuitry at pixel level and large format array multiplexing. We proposed to develop novel fast readout integrated circuits (ROIC) to be integrated with large photon-counting infrared detector arrays into 3D imaging cameras with photon-counting sensitivity. These new cameras would support NASA missions in applications such as space docking, landing, remote mapping, and robotic vision. The goal of this program is to develop smart-pixel ROIC arrays in silicon with enhanced radiation tolerance, ready for hybrid integration with large infrared photon-counting avalanche photodiode arrays, that will enable large-area detectors with short integration time, sub-nanosecond timing resolution, and on-pixel logic. In Phase I, we have simulated, implemented, and successfully validated all the blocks of a ROIC array specifically developed for operation with infrared photon-counting arrays. In Phase II, we will improve, fabricate and qualify ROIC arrays with integrated timing functions at pixel level and capable of integration in flip-chip technology with large infrared photon counting detector arrays.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
aPeak, Inc.	Supporting Organization	Industry	Newton, Massachusetts

Primary U.S. Work Locations	
Maryland	Massachusetts

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes